

APPENDIX D
HABITAT EVALUATION PROCEDURE INFORMATION



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DRAFT REPORT

**HABITAT EVALUATION PROCEDURES REPORT
FOR THE SPRING LAKE SECTION 206
AQUATIC RESTORATION PROJECT
SAN MARCOS, TEXAS**



DRAFT

EVALUATION OF IMPACTS TO WILDLIFE HABITAT FOR THE SPRING LAKE SECTION 206 AQUATIC ECOSYSTEM RESTORATION PROJECT

1.0 INTRODUCTION

This evaluation addresses the potential effects, beneficial and adverse, of the proposed U.S. Army Corps of Engineers (USACE) Spring Lake restoration plan in San Marcos, Hays County, Texas. The Continuing Authorities Program (CAP) and Section 206 of the Water Resources Development Act of 1996 authorize the USACE to participate in the development and implementation of projects to restore terrestrial and aquatic habitats that have been significantly disturbed, degraded, or altered. The proposed aquatic ecosystem restoration project would be cost-shared with Texas State University – San Marcos (TxSt), the current owner of the property. The proposed project is currently in the feasibility phase of the Section 206 process, which includes development of an integrated Detailed Project Report and Environmental Assessment (DPR/EA) by the Fort Worth District of USACE.

The Habitat Evaluation Procedures (HEP) program was used to quantify potential impacts to wildlife habitat due to proposed restoration measures and alternatives in and around the Spring Lake area. HEP sampling is used to assess existing and future habitat conditions, and compare project alternatives.

This study evaluated direct impacts resulting from the proposed restoration project surrounding the Spring Lake area. The major goals of this study were as follows: (1) to determine baseline habitat suitability for given species and; (2) predict impacts to each species habitat as a result of various combinations of restoration measures.

2.0 A SUMMARY OF HEP

HEP was developed in order to quantify the impacts of habitat changes resulting from land or water development projects. HEP is based on Habitat Suitability Index (HSI) models that provide a quantitative description of the habitat requirements for a species or group of species. HSI models use measurements of appropriate variables to rate the habitat on a scale from zero (unsuitable) to 1.0 (optimal). In a typical HEP study, evaluation species representing existing or future habitats are chosen for the study area. The value of an area to a given species is quantified using habitat units (HU). HUs are the product of the area of available habitat, multiplied

by the suitability of the habitat for the given species. Suitability is assessed using data collected in the field which is then applied to a given species' HIS model. Species may be chosen because of their ecological, recreational, or economic value, or because they represent groups of species (i.e., guilds) that have similar habitat needs.

HUs available for each species are estimated for several target years and then averaged over the life of the project (typically 50 to 100 years) to obtain average annual habitat units (AAHU). Estimates of future habitat conditions are quantified for various combinations of possible measures or alternatives. The No Action Alternative is represented by the combination in which no measures are proposed. Impacts on a given species are then determined by calculating the difference in AAHUs between alternatives.

3.0 METHODOLOGY

3.1 HEP Team

Through the HEP process, representatives of local, state, and federal resource agencies are contacted by the lead agency to form a HEP team. The HEP team functions throughout the entire HEP process from setting goals and objectives of the evaluation to selecting evaluation species and collecting field data, and calculating results or making modifications.

For the Spring Lake Section 206 Aquatic Ecosystem Restoration Project, the HEP team members consisted of (1) Mr. Pat Fogarty (Southwest Texas State University), (2) Mr. Randy Moss (Texas Parks and Wildlife Department), (3) Mr. Pat Connor (U.S. Fish and Wildlife Service (USFWS)), (4) Dr. Hank Jarboe (USACE), (5) Mr. Jeff Tripe (USACE), (6) Mr. Mike Schulze (Gulf South Research Corporation (GSRC)), (7) Mrs. Kate Roussell (GSRC), (8) Mr. Chris Ingram (GSRC), and (9) Mr. Brad Yarbrough (GSRC). All of the HEP team members were invited to provide assistance in designing the HEP study and participate in field sampling. All members were provided with a list of species that were applicable to the region, and asked to comment on or contact GSRC representatives if questions or problems were encountered.

3.2 Project Area and Cover Types

The proposed ecosystem restoration project is located in San Marcos, Texas, approximately 40 miles south of Austin (Figure 3-1). The proposed project would consist of the removal of man made facilities associated with the Aquarena Center, establishment of a vegetative buffer zone

between the golf course and around the Spring Lake area, the removal and control of non-native species, and the revegetation of native trees, shrubs, grasses and forbs. The project surrounds the Spring Lake and Aquarena Facilities, which includes approximately 20 acres of lacustrine habitat, 5 acres of riparian habitat, and 15 acres of the Aquarena Facilities (Figure 3-2).

The proposed project area falls into one of three habitat types: riparian, lacustrine, or disturbed communities. Riparian areas consist generally of hackberry (*Celtis occidentalis*), cottonwood (*Populus deltoides*), sweet pecan (*Carya illinoensis*), live oak (*Quercus virginiana*) and tallow tree (*Sapium sebiferum*) in the overstory. The sampling/shrub layer consists of ligustrum (*Ligustrum sinense*), deciduous holly (*Ilex decidua*), palmetto (*Sabal minor*), and small tallow trees. The herbaceous layer contains such vines as ladies-eardrops (*Brunnichia cirrhosa*), greenbriers (*Smilax* sp.), and wild grape (*Vitis* sp.) The lacustrine habitat consists primarily of exotic species such as elephant ear (*Colocasia antiquorum*), water hyacinth (*Eichhornia crassipes*) and hydrillia (*hydrillia verticillata*). Native aquatic species such as coontail (*Ceratophyllum demersum*) *Sagittaria* sp., and cattail (*Typha latifolia*) were found sporadically in or along the lake. The disturbed community around the Aquarena Center contains several buildings, sidewalks and a large parking lot. Besides a few scattered pecan trees and maintained turf grasses, there is very little vegetation found in this area.

3.3 Evaluation Species and Habitat Suitability Index Models

Existing HSI models were reviewed to determine 1) species applicable to this region of Texas, and 2) applicability of species to cover types created from habitat restoration. A list of applicable species were selected and ranked using criteria relevant to the project by HEP team members. Five species were chosen for the habitat evaluation, they were: northern bobwhite (*Colinus virginianus*), eastern meadowlark (*Sturnella magna*), redear sunfish (*Lepomis microlophus*), eastern cottontail (*Sylvilagus floridanus*), and mink (*Mustella vison*)

Habitat Suitability Index (HSI) models developed by the USFWS have been published for all five species. The principle authors and dates of publication for the five HSI models used are as follows; (1) mink (Allen 1982), (2) eastern cottontail (Allen 1984), (3) redear sunfish (Twomey et al. 1984), (4) eastern meadowlark (Schroeder and Sousa 1982), and (5) northern bobwhite (Schroeder 1985). All models were used in their entirety. Habitat variables required by the representative HSI models were collected in the study area given in Form 1. In Form 1, variables

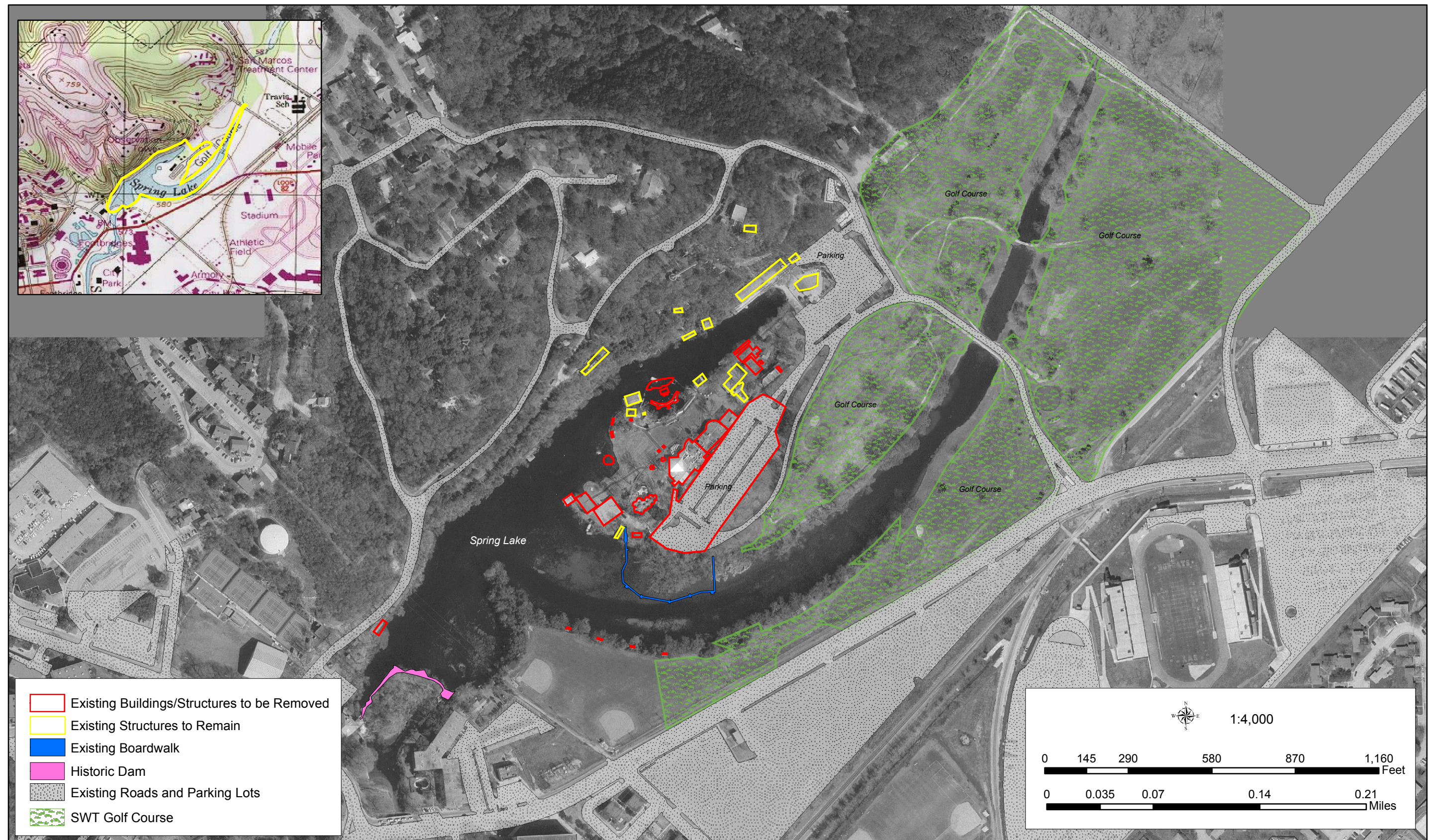


Figure 3-2: Existing Conditions

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1, 7, 8, 9, 11, 12, 13, 14, and 15 were collected for the northern bobwhite. Variables 1, 2, and 3 were collected for the eastern cottontail. Variables 4, and 5, were sampled for the redear sunfish. Variable 6 was collected for the mink. Finally, variables 7, 8, 9, and 10 were collected for the Eastern meadowlark.

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Form 1
Habitat Variables for Selected Species

Study Area:

Date:

Plot #:

Plot Size:
0.10 acre = 37.2 ft².

Transect #:

Habitat Type:

Collected by:

Temp:

Cloud Cover:

Humidity:

Other:

1. Percent of shrub crown closure (the percent of the ground surface that is shaded by a vertical projection of the canopies of woody vegetation **< or =** to 16.5 ft. in height).
2. Percent tree canopy closure (the percent of the ground surface that is shaded by a vertical projection of the canopies of woody vegetation **> or =** to 16.5 ft. in height).
3. Percent canopy closure of persistent herbaceous vegetation (the percent of the ground surface that is shaded by a vertical projection of all non-woody vegetation that may be expected to remain standing after the growing season).
4. Percent of wetland basin dominated by persistent emergent herbaceous vegetation (the proportion of a wetland that supports emergent herbaceous vegetation that normally remains standing after the growing season (e.g., cattails and/or bulrushes)).
5. Water regime (the permanence of surface water). (check one)
____ Permanently flooded: water covers the land surface throughout the year in all years.
____ Intermittently exposed: surface water persists throughout the growing season in most years.
____ Semipermanently flooded: Surface water persists throughout the growing season in most years.
____ Seasonally flooded: Surface water is present for extended periods, especially early in the growing season, but is absent by the end of the season in most years.
____ Temporarily flooded: surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface for most of the season.
____ Intermittently flooded: The substrate is usually exposed, but surface water is present for variable periods without detectable seasonal periodicity.

6. Percent tree and/or canopy closure within 328 ft. of the water's or wetland's edge (the percent of the ground surface within 328 ft. of the water's edge, or edge of a wetland, that is shaded by a vertical projection of the canopies of all woody vegetation).
7. Percent herbaceous canopy cover (the percent of the ground that is shaded by a vertical projection of all nonwoody vegetation).
8. Proportion of herbaceous canopy cover that is grass (the relative percent of all herbaceous cover that is comprised of grasses).
9. Average height of herbaceous canopy (the average vertical distance from the ground surface to the dominant height stratum of the herbaceous vegetative canopy during average spring conditions).
10. Distance to perch site (such as tall forb, shrub, tree, fence, or telephone wires) (average distance from random points to the nearest suitable perch site, within or outside the boundaries of the cover type).
11. Percent canopy cover of preferred bobwhite herbaceous food plants (the percent of the ground surface that is shaded by a vertical projection of herbaceous vegetation that is considered to be a preferred bobwhite food plant).
12. Percent of ground that is bare or covered with a light litter (the percent of the ground surface that is nonvegetated or covered with vegetative litter that is less than 2 inches deep).
13. Number of pine or oak trees >10 inches dbh.
14. Soil moisture regime(the soil moisture on the ground surface during average spring/early summer conditions). Check one.
- ____ Soils typically moist to saturated.
- ____ Soils typically dry to moist.
- ____ Soils typically dry.
15. Distance between cover types (0-1,312 ft.). 264 ft. equals an SI of 1.

3.3 Sample Design

3.3.1 Plot Sampling

Circular plots (0.10 acre) were used for habitat sampling. Plot data were taken in the riparian and disturbed areas of the Aquarena Center. Aerial photograph interpretation was used for estimating variables in lacustrine habitat. All water variables were then confirmed at the lake's edge while in the field.

At a randomly located plot center, all applicable variables were recorded. Percent cover estimates were made for canopy cover of all trees ≥ 16.5 ft., shrub crown closure, canopy closure of persistent herbaceous vegetation, canopy closure within 328 feet of the water's edge, herbaceous canopy cover, proportion of herbaceous canopy cover that is grass, canopy cover of preferred bobwhite herbaceous food plants, and amount of ground that is bare. After completing the percent cover variables, the number of pine or oak trees greater than 10 inches diameter at breast height (dbh), soil moisture regime, distance between cover types, and distance to perch sites were noted.

3.3.2 Location and Number of Plots

As mentioned earlier, the habitat sampled included riparian habitat, lacustrine habitat, and disturbed areas (areas that included buildings or hard surfaces associated with the Aquarena Center). Prior to field investigations, a total of 10 plots were randomly placed in all habitat types on an aerial photograph to ensure adequate sampling of all habitat types (Figure 3-3).

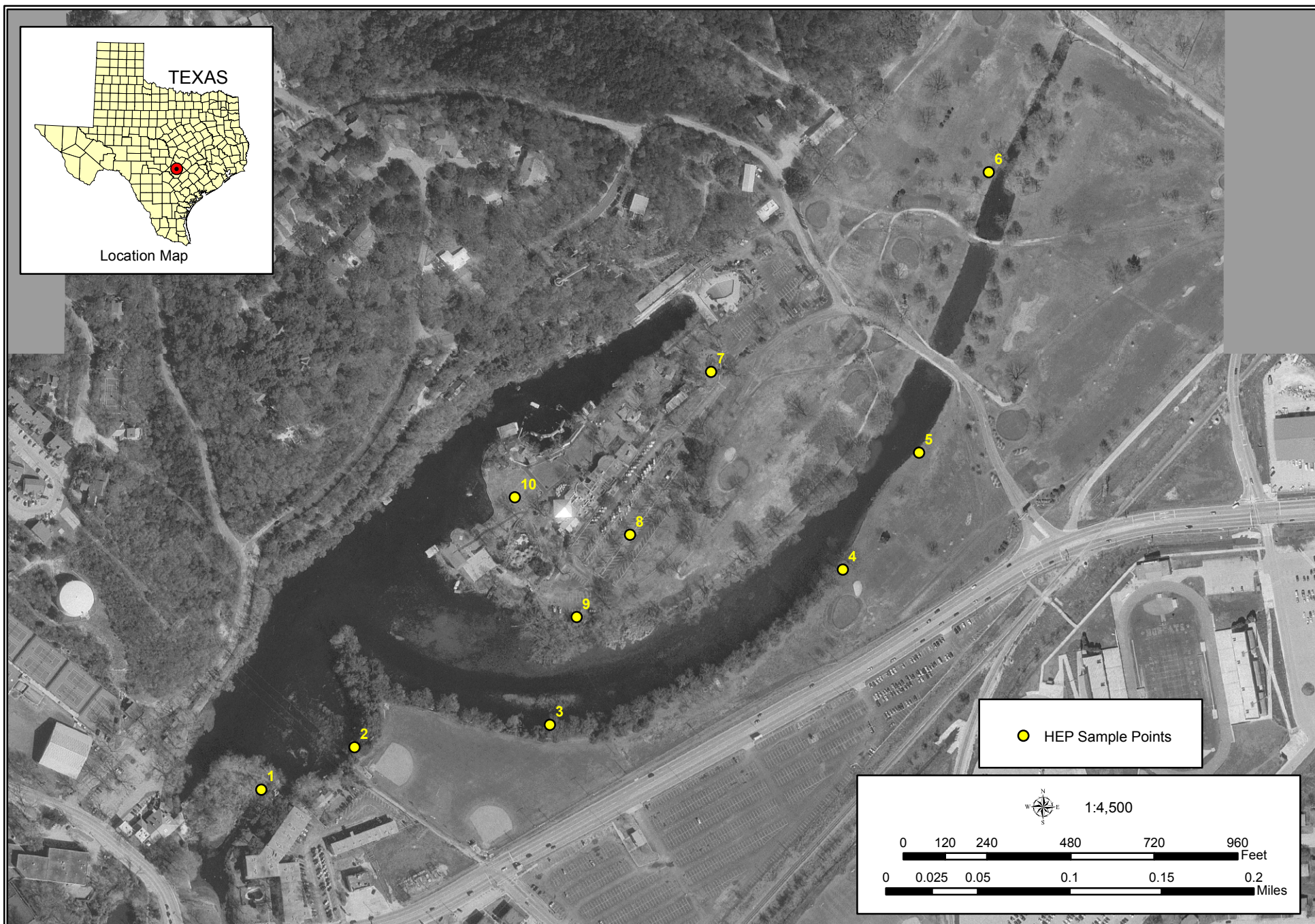


Figure 3-3: HEP Sample Points

3.4 Calculating Baseline Habitat Conditions

After collecting habitat variables, baseline habitat conditions were assessed. Field data forms were checked for any missing or erroneous data and habitat variables to be calculated from field-collected data were determined. Once all data were checked and tabulated, measures for each habitat variable were averaged and the average was used to obtain the Suitability Index (SI) for each variable. The SIs were used to calculate HUs using the appropriate HIS model.

4.0 RESULTS

4.1 Baseline HU's

Baseline HU values for the each species were calculated and results are presented in Table 4-1.

Table 4-1. Baseline Values for Existing Conditions

Evaluation Species	Representative Habitat (Acres)				HSI	HU
	Woodland		Grassland	Lacustrine		
	Hill	Peninsula				
Eastern meadowlark	x	x	0.10	x	0.10	0.01
Mink	2.42		x	x	0.61	1.47
Eastern cottontail	4.92	0.80	5.07	x	0.5/0.0	2.41/0
Northern bobwhite	4.92	0.80	5.07	x	0.5/0.0	2.41/0
Redear sunfish	x	x	x	22.40	0.4	9.12

4.2 Average Annual Habitat Units (AAHU)

Through HEP, quantitative impacts of project plans are determined by comparing the net change in AAHUs for each evaluation species for with-project and without-project alternatives. Table 4-2 displays the AAHUs for the with-project and without-project alternatives and shows the net change in AAHUs.

Table 4-2. Estimated AAHUs with Implementation of all Proposed Measures

Evaluation Species	Output (AAHU)		
	Without Project	With Project	Net Change
Eastern meadowlark	0.01	5.85	5.84
Mink	1.47	8.34	7.57
Eastern cottontail	2.46	10.86	8.39
Northern bobwhite	2.46	11.86	9.40
Redear sunfish	9.12	11.60	2.48

Table 4-2 shows that existing conditions in the project area (without-project) supporting almost no AAHUs for the eastern meadowlark. With the proposed restoration project, a substantial increase of 5.84 AAHUs for the eastern meadowlark is anticipated from the native grassland that will be planted where the existing Aquarena Center is now located. The restoration of native grass and forbs to this area is expected to provide 7.5 acres of new eastern meadowlark habitat to the area, which is expected to provide all life requisites needed.

An increase of 7.57 AAHUs for the mink is expected with the implementation of the restoration plan as Table 4-2 demonstrates. The project area currently supports 1.47 AAHUs for the mink. The gain in AAHUs seen under the with-project alternative is a result of the increase in habitat area and life requisites of the mink. Cover life requisites for the mink will be increased with the removal of exotics and the creation of a riparian buffer zone, which is currently maintained to the waters edge under current golf course maintenance practices. According to the mink HSI model, the limiting factor for mink in the project area is the percent shoreline cover. The lack of mink AAHUs currently in the project area is primarily due to mowing, which removes the majority of the riparian vegetation cover, therefore limiting the cover requisite for the mink.

The AAHUs for the eastern cottontail will increase dramatically due to the increase in additional acreage with the proposed restoration plan. An additional 10.79 acres of eastern cottontail habitat will be provided, which will raise the AAHUs from 2.46 to 10.86. The eastern cottontail's limiting factor is winter food/cover. With the proposed restoration plan, the cottontail will utilize both grassland areas in addition to forested areas needed to satisfy all life requisites.

Based on the HSI model for the northern bobwhite, the restoration plan will provide 11.86 AAHUs, whereas without the project provided only 2.46 AAHUs for the bobwhite. The distance between cover types, which averages 640 feet, primarily limits the suitability for the northern bobwhite in the project area. Although the northern bobwhite is somewhat limited by the distance between the grassland and wooded habitat types that will be provided with the restoration project, a significant increase in quality bobwhite habitat is expected. The bobwhite model is dependent on the presence of both cover types for this project. Since the grassland habitat will not provide the cover need for northern bobwhite habitat, the adjacent wooded riparian zone will be used as cover. Conversely, the wooded riparian habitat does not provide needed winter food components, which will be provided by the grassland area.

Existing lacustrine habitat provides 9.12 HUs for the redear sunfish (see Table 4-1). Removal of the deteriorating, submerged structures would provide additional area of greater suitability for the redear sunfish by increasing the proportion of deep water habitat and preventing degradation of water quality. This increased area and improved suitability results in a gain of 2.48 AAHUs for the redear sunfish.

5.0 Summary

The completed HEP for the section 206 Aquatic Ecosystem Restoration Project at Spring Lake demonstrates large gains in AAHUs upon completion of the restoration plans. The five species that were selected for the HEP analysis, serve as a guild for wildlife species that are indigenous to the area. With the proposed project, re-establishment of native grassland vegetation and the creation of a riparian buffer zone around Spring Lake would provide high quality habitat for wildlife, which is now absent. These terrestrial habitats would also improve water quality in lacustrine habitats. The removal of submerged structures would create additional lacustrine habitat and would further improve water quality. Improvements to and creation of additional habitat under the proposed project have the potential to result in a net gain of approximately 20 grassland AAHUs, 6 riparian AAHUs, and 2.5 lacustrine AAHUs. From an ecological standpoint, the restoration project would provide much needed improvements to habitat quality and quantity, which can be used by a wide variety of species that depend on habitat created by the unique environmental conditions of Spring Lake.

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